I. Introduction

A. Disease description

Classical Swine Fever (CSF) is a highly contagious viral septicemia affecting only swine. Also known as Hog Cholera, it has been eradicated from many developed nations with extensive swine production but is still endemic in much of the world. Outbreaks in countries free of CSF can have a severe impact on producers due to high swine mortality, the curtailment on exportation of swine and pork products, and from costs incurred to control and eradicate the disease.

1. **Etiologic Agent**. The etiological agent of CSF is a small enveloped RNA virus of the family Flaviviridae and genus Pestivirus, which also includes the Bovine Viral Diarrhea (BVD) virus and Border Disease (BD) virus. CSF virus is stable in cool, moist, protein-rich environments such as pork and pork products and can survive in cured or smoked pork for up to188 days and over 4 years for frozen pork.

2. **Distribution**. CSF occurs nearly world wide with the North American and Australian continents being the key exceptions [see figure 1]. Canada has been free of CSF since 1963 and the US was recognized free in 1978. Mexico is free of CSF in the Northern provinces that border the US and has a control program in the other provinces (however movement of pigs from the endemic area led to an outbreak in the northern region in 2000).

   CSF is still endemic in most of central and South America and vaccination is the chief means for control. However, Belize, Panama, Chile, Uruguay and parts of Brazil are considered free of CSF. CSF reemerged in Cuba in 1993 and has since spread to Haiti (August, 1996) and the Dominican Republic (June, 1997).

   Several major outbreaks in the European Union (EU) have occurred in last decade, particularly in Austria, Belgium, Germany, Italy, Spain, and The Netherlands. For example, between 1990 and 1998 there were 424 outbreaks of CSF in Germany. Several of the outbreaks occurred due to illegal swill feeding (waste feeding). Also, wild boars have been identified as a reservoir for CSF in Western Europe resulting in several outbreaks in domestic pigs. In most of Central and Eastern Europe vaccination is still permitted to control CSF.

3. **Clinical signs**. The clinical manifestation of CSF depends primarily on the viral strain, as field strains vary widely in their virulence. Host characteristics also play a role, particularly the age of the host (more severe disease in young pigs), immune status, nutritional condition, and breed. Generally though, CSF manifests either as an acute, chronic, or late-onset infection of swine.

   Acute infection is the more 'classical' presentation of CSF and is usually seen in piglets 12 weeks old or less. Pathological lesions are most commonly found in lymph nodes, spleen and kidneys and reflect those of a septicemic disorder with multiple hemorrhages of various sizes. Infarcts of the spleen are considered pathognomonic for CSF when present. Antibodies become detectable 2-3 weeks post infection, with a practical minimum of 18 days. Several domestic disease conditions produce a similar clinical picture.

   Chronic infection consists of three phases and is always fatal though animals may survive 2-3

months before dying. Antibodies may only be detectable temporarily during the first month of infection but then disappear and can not be detected.

"Late onset" infection occurs when pregnant swine are infected with CSF virus. Infections prior to day 50 of gestation result in abortions, stillbirths, mummies, or birth of deformed piglets. The clinical signs in sows are usually mild, nonspecific and not indicative of CSF.

For sows infected about 50-70 days of gestation, piglets will be born persistently viremic (similar to BVD viral infection in calves) and may be clinically normal for months or may exhibit congenital tremors from birth. Eventually, at 2-11 months of age, pigs will begin to waste and become unthrifty. Persistently infected pigs shed virus constantly until they die!

4. **Epidemiology**. Movement of normal looking infected pigs is the most frequent method of transmitting CSF virus. Other important sources include infected feral swine and contaminated pork and pork products. Virus can be shed in any bodily secretion and the most frequent route of infection is oronasal. Important mechanical vectors for introduction of virus into a herd include transport vehicles and people.

   The rate of transmission between swine within a breeding herd is slower than the transmission rate between weaned pigs. Therefore, CSF may be present in populations of breeding stock for quite some time before it is noticed. An infected herd will be detected sooner if the infection starts in the nursery or finisher section than when the infection starts among the breeding stock.

   In experimentally infected swine the incubation period averages 7-10 days (range of 3-15 days). Under field conditions, the incubation period is approximately 2-4 weeks. The expected morbidity rates are 33-45% of pigs at risk. Between 15-30% of cases can be expected to die. [See Table 1]

5. **Economic impact**. The economic impact of CSF can arise from excessive mortality, infertility, and other deleterious health effects at the herd level. A severe economic consequence of an incursion of CSF into the US is the immediate halt to exports. The US pork industry currently exports over 12% of its annual production with a value of more than $1.5 billion. The US is the world's second largest exporter of pork.

   A significant impact is the cost of disease control and eradication. US costs for the eradication of CSF totaled more than $140 million in 1978. This would be more than $540 million in 1999 dollars. Direct cost of The Netherlands control program for CSF in 1983-85 was $93 million compared to the 1997-98 Netherlands outbreak in which costs associated with the slaughter of infected and exposed swine, production prohibitions, welfare slaughter, movement restrictions, and effects on allied industries exceeded $2 billion.

6. **Methods and prospects for control**. Control of the CSF virus needs to occur at the animal level, herd level, and national level.

   Animal level. With acute infection, neutralizing antibodies are detectable 2 or more weeks after infection and last several years, if not a lifetime. With chronic infection, neutralizing antibodies are detectable briefly at the end of the first month but quickly disappear. Congenitally infected pigs are persistently viremic and seldom produce specific antibodies.

Maternal antibodies protect piglets against mortality for the first 5 weeks of life. They do not protect against virus replication and shedding.

Herd level. In endemic regions, the primary method for controlling CSF in herds is vaccination. The C strain is the most extensively used vaccine. It is safe to use in pregnant sows and young piglets and can be used effectively as an emergency vaccination during an outbreak. The C strain provides protection against infection as early as 5 days post-vaccination and provides protection for several years and probably life. Vaccinated sows pass maternally derived antibodies which protect piglets against mortality until 5-8 weeks of age. Maternally derived antibodies do not prevent infection and shedding of virulent virus.

Other control measures instituted at the herd level include the rigorous enforcement of biosecurity practices, particularly truck cleaning and disinfection (C&D), control of visitors, control of birds and rodents, and hygienic injection practices, i.e. not re-using syringes or needles.

National level. A national control policy for CSF depends on the incidence and prevalence of the infection in the domestic and wild pig populations respectively. It also depends on the pig density in the area of infection. The control of CSF in wild boar is still an unresolved problem.

The US CSF emergency disease guidelines call for a three-pronged approach. Time is of the essence in the execution of these control measures. The longer the infected herd is infectious, the higher the likelihood of transmission of CSF virus to surrounding and contact herds. Therefore, the interval between diagnosis of an infected herd and subsequent pre-emptive slaughter of herds should be as short as possible.

B. Recent CSF surveillance efforts

Currently, Veterinary Services (VS) relies on three surveillance programs for detection of CSF. One is passive reporting by private practitioners (or producers, diagnosticians, slaughter plant inspectors) of suspicious cases with clinical signs similar to a foreign animal disease such as CSF. Once reported to the Area Veterinarian in Charge (AVIC), a Foreign Animal Disease Diagnostician (FADD) is dispatched to investigate the case and collect samples for shipment to the Foreign Animal Disease Diagnostic Laboratory (FADDL) at Plum Island, NY. A Lotus Notes database, Emergency Management Response System (EMRS), is used to capture administrative data on each investigation. See VS Memorandum 580.4.

The other surveillance programs rely on active serological / tissue monitoring. In the second surveillance program, specimens are collected from high risk populations such as waste feeding operations along the Texas – Mexican border. Beginning in 1998, CSF testing responsibilities were transferred from the National Veterinary Services Laboratories (NVSL) in Ames, Iowa to FADDL at Plum Island. Subsequently, serum testing has declined dramatically as the focus has shifted to testing tissue samples for antigen rather than serum for antibodies. The December 2003 CSF surveillance plan provides the rationale for this transition.

The third surveillance program came about as a result of the CSF outbreak in Hispaniola in 1997 when $2.9 million dollars from CCC funds were designated for CSF surveillance. See VS Notice 99-13. This Notice called for AVIC's to identify high risk premises, develop sampling plans, and

build cooperation for CSF surveillance. By way of example, it was suggested that "a sample of 10 percent of the specimens collected for pseudorabies virus (PRV) testing at the lab will be submitted to FADDL for CSF testing as well." The majority of these samples are collected from breeding swine. Another $500,000 from CCC funds was designated for CSF surveillance in FY03. Again, states were charged with and developed specific plans. However, because of the exotic Newcastle disease outbreak, efforts were diluted and a large portion of the monies were not spent.

While serology allows for the detection of surviving animals beyond the viremic stage, that method of identification of CSF in domestic slaughter swine surveillance has drawbacks:

- Serologic surveillance, either of Texas waste-feeders or PRV screening samples, does not cover other important high risk populations. If only these two populations are monitored (which are not likely to be the first infected) then the identification of the introduction of CSF into the United States could be delayed until the disease has spread to these populations.
- Serologic surveillance does not target domestic swine displaying clinical signs consistent with CSF.
- Serologic surveillance at slaughter plants only target sows and boars tested for PRV, so market swine are not tested for CSF antibodies. Market swine are believed to be a more sensitive indicator of CSF virus exposure.
- Serologic surveillance for CSF antibodies does not meet the objective of early detection. Previous studies suggest that using serology could delay the detection of a CSF introduction by several months or more.
- Tag retention, tag correlation with samples, and compliance with tagging regulations for transported animals has been less than satisfactory for performing accurate trace backs.

C. Objectives for surveillance

As identified in the Swine Futures Project report, there are three surveillance objectives for foreign animal diseases such as CSF. First and foremost is the rapid detection of the CSF virus in US swine (I). As part of a comprehensive surveillance plan, CSF surveillance also should entail monitoring the risk of introduction into the US. Thus the second objective is to conduct surveillance on hazards associated with the introduction of CSF into US swine (II). The third objective is to track international CSF status, particularly of neighboring countries and trading partners (III). Besides the foreign animal disease concern, there is the additional objective of conducting CSF surveillance to document freedom in order to facilitate trade (IV).

The objectives for CSF surveillance can be summarized as follows:

Objective I: Surveillance for rapid detection of CSF virus in US swine.
Objective II: Monitor the risk of introduction of CSF into US swine.
Objective III: Surveillance of international CSF status.
Objective IV: Surveillance to document freedom of CSF.

D. Identification of end – users

Since surveillance is 'information for action', it is important to explicitly identify the action takers (or decision makers) for each of these surveillance objectives. Further in the plan, specific users and actions will be described for each surveillance program.

For objective I, the primary action if the disease is detected will be the implementation of State-Federal control and eradication activities. The industry will be a close partner in such a situation. The action takers related to Objective I are VS Emergency Programs, VS management team (VSMT), AVIC's, State Veterinarians, National Pork Board (NPB), National Pork Producers Council (NPPC), State pork associations, American Association of Swine Veterinarians (AASV), FADDL and the NAHLN.

For objective II, the primary actions arising from the detection of increased risk would be to bolster import restrictions, tighten border controls, and modify surveillance programs related to objective I. Therefore the primary users of surveillance information related to this objective are National Center for Import and Export (NCIE), Plant Protection and Quarantine (PPQ), especially those responsible for border control, Department of Homeland Security (DHS), NPPC, and those responsible for the design of surveillance programs to meet objective I.

The findings from objective III will have a major influence on the design of surveillance programs instituted under objective II. This information will also benefit the Animal and Plant Health Inspection Services' (APHIS) International Services as well as VS representatives to the World Organization for Animal Health (OIE), NCIE, and those decision makers mentioned for objective II.

The providers of surveillance data, including producers, veterinarians, and veterinary diagnostic laboratories (VDL), are generally considered an important audience for the information generated from surveillance programs. Dissemination of information to these groups will result in greater support, participation and improved compliance with surveillance programs.

II. CSF surveillance plans by objective

Each of the four objectives may require one or more surveillance programs. For each surveillance program developed there will be one or more case definitions and specific characterizations of the indicators that are to be monitored over time. The determination of what surveillance programs and case definitions are needed to fulfill Objective I hinged on two basic questions: 1) how will CSF enter the US swine herd; and 2) after entry into US swine, how will it be recognized?

Objective I: Surveillance for rapid detection of CSF virus in US swine.

The initial expression of CSF in US swine would be variable and unpredictable due to myriad host factors and the broad diversity of virulence among strains of CSF virus. Strains vary from high to low virulent; and symptoms range from acute death to persistent congenital infections with no apparent signs until death. Therefore different surveillance strategies will be required to detect the different clinical manifestations (see following table).

Clinical manifestation	Clinical signs are … present	Clinical signs are … noticed	Laboratory detection of CSF antibody
Acute infection	Yes	Yes	Yes
Mild; early phase chronic infection	Yes	Not likely	Yes
Congenital persistent infection	No[1]	N/A	No

[1] While typical CSF symptoms are not exhibited in breeding sows, congenital infections may be accompanied by reproductive losses, stillbirths and weak born live pigs.

For acute infection, surveillance activities can be based on clinical signs as signs are present and likely to be noticed by producers and practitioners. For mild cases or chronic infections, where recognition of CSF symptoms is less likely, it would be prudent to develop surveillance activities based on diagnostic testing to supplement surveillance based on clinical signs.

For congenital persistent infections, effective surveillance of young pigs would be difficult and costly since no signs exist to raise the flag of suspicion. Surveillance activities could be based on herd level stillborn rates (or other reproductive parameters), for example in an active surveillance program based on the population of Pig Champ users. However, such an indicator may lack the specificity to be economically feasible. Furthermore, since congenitally infected pigs are immuno-tolerant to CSF virus and do not generate an antibody response (despite high viremia), laboratory based surveillance activities would have to be antigen based. This category of infection represents a critical vulnerability in the design of a comprehensive CSF surveillance system. (Of some consolation is the tendency for a portion of persistently infected pigs, upon re-exposure to CSF, to become clinical and exhibit acute symptoms.)

The key point here is that there can not be a single surveillance program for the detection of CSF. There must be at least two surveillance programs in place that are based on either reporting of clinical signs or diagnostic testing of populations at risk, preferably for the detection of CSF virus or nucleic acid.

A. Target population for surveillance

The second basic question to consider is how CSF will enter the US swine herd. CSF can be transmitted to US swine either by direct contact with recently introduced infected pigs, exposure to contaminated pork or pork products, or via mechanical vectors such as people or pets. A likely way CSF will be introduced is via contact of susceptible US swine with CSF infected pigs which includes importation of live pigs, semen, or germplasm or exposure to illegally transported infected pigs. Other important methods of introduction include importation of contaminated pork and pork products which may find their way to US swine either via proximity to disposal sites for such products (e.g. airports, military bases, and landfills) or waste feeding sites. Mechanical vectors such as trucks, people and pets can transmit CSF virus to susceptible swine as well. Finally, exposed feral swine can become a reservoir of CSF virus to domestic swine.

Entry routes for CSF into US swine and the implications for target populations to monitor.

How will CSF enter US?	**Populations to monitor**
Pigs	
Imported live pigs	Seed-stock producers; herds importing pigs
Imported semen	Boar studs; herds importing semen
Imported germplasm	Seed-stock producers; herds importing germplasm
Illegal movement	Producers on borders
Pork and pork products	
Meat products	Waste feeders; herds near disposal sites for imported meat; feral swine
Waste	Waste feeders; feral swine
Mechanical vectors	
People	Herds with visitors or workers from foreign countries; or with employees visiting farms in other countries.
Pets	

Each method of transmission suggests targeting a specific population of US swine.

B. Surveillance programs

The following surveillance programs are proposed for meeting Objective I of CSF surveillance.

1. Population-based passive reporting of suspicious CSF cases.

2. Laboratory-based surveillance of serum and tissue submitted from sick pigs.

3. Active surveillance of high risk swine in FL, TX, and PR.

4. VMO/AHT-based active surveillance of registered waste feeders for CSF.

5. Population-based active surveillance of high risk herds.
   E.g. herds importing swine genetic material or near disposal areas of pork meat.

The first two surveillance programs cover the entire swine industry whereas the other three surveillance programs cover a specific target population. ***This version of the CSF plan provides details for the first three surveillance programs.***

1) Population-based passive reporting of suspicious CSF cases.

Target population:
The intended coverage of this surveillance program would be any and all premises where domestic swine exist. This includes all 50 states and Puerto Rico.

Actual population:
In reality, suspicious cases of CSF (or other FAD of swine) have been reported infrequently (average of 30 FAD investigations a year). The majority of reports are initiated by private practitioners. However, many swine operations (albeit small ones) do not have a relationship with a veterinarian. Therefore, the actual population covered by the current reporting system is more limited than the target population this plan aims to cover.

Efforts to enhance reporting will be focused on high risk states. The criteria for determining a high risk State was initially taken from VS Notice 99-13 (currently inactive) and was revisited by Dr Tim Clouse, CADIA to generate a risk classification of States.

High risk areas for CSF include those with garbage feeding operations, backyard swine operations, feral swine hunting clubs, military bases, international air or sea ports, farming operations utilizing an international labor force, and corporations engaging in international movement of swine. High risk is also a function of the number of swine in each state and the number of swine imports in each state.

The following territory will be identified as **very high risk:** **Puerto Rico**

The following 18 states will be identified as **high risk**:

Eastern Region	**Western Region**
Florida	Arizona
Georgia	California
Illinois	Hawaii
Indiana	Iowa
Minnesota	Kansas
New Jersey	Nebraska
New York	New Mexico
North Carolina	Oklahoma
	Texas
	Washington

The remaining unlisted states will be designated **low risk**.

Case definition:
In order to improve the reporting of suspicious CSF cases in higher risk states, particularly where swine veterinarians are sparse, the following case definition was developed as a guide for what cases should be reported. A clinical description of CSF is provided. For reporting, the clinical case definition states that cases should be compatible with the clinical description and may or may not have additional clinical (necropsy findings) or epidemiological features (risk factors).

Clinical description:
Affected swine will experience a viremia characterized by persistent fever, skin discoloration, conjunctivitis, and diarrhea that is unresponsive to antibiotics. Leucopenia is a consistent clinical laboratory finding. Severity is variable. Three common forms are acute, chronic, late onset.

Acute – illness usually in weaned pigs under 12 weeks of age that is unresponsive to antibiotics and characterized by persistent fever, skin discoloration, conjunctivitis, hind-limb weakness and / or diarrhea.

Chronic – characterized by three phases: sub acute infection followed by brief recovery before relapse of fever, anorexia and wasting leading to death 1-3 months after onset.

Late onset –pigs born to sows infected after day 50-70 of gestation may be persistently infected and appear normal for several months before dying or be born with congenital tremors. (Sows infected prior to day 50-70 of gestation may abort or give birth to stillbirths, mummies, or pigs with congenital defects.)

Clinical case definition for field identification of suspicious cases:
A herd exhibiting one or more of the following clinical features:

- a herd with clinically compatible cases
- a herd with clinically compatible cases with necropsy examination demonstrating splenic infarcts, internal hemorrhages of the kidney, bladder, lymph nodes, larynx, or other evidence of septicemia.
- A herd with clinically compatible cases that in the previous three months had either imported genetic material from a foreign country, fed waste to swine, or had on site a person recently on a farm in a foreign country.

Case classification:
A case is classified as "Suspect" when it is reported as a CSF suspicious case that meets the clinical case definition. Additional case classifications can be found in the full CSF case definition (Appendix A).

Case reporting:
The case definition is to be used by those making direct observations of swine that are in a position to notice the clinical expression of CSF in US swine. These include producers, practitioners, slaughter inspectors, and laboratory diagnosticians. A "suspect" case should be reported immediately to the State AVIC. The AVIC's responsibilities to take action are detailed in VS Memorandum 580.4 and result in a timely investigation of the herd by a FADD.

Data collection and sampling
When the FADD concurs that the herd meets the clinical case definition for CSF, the FADD will collect specimens for shipment to FADDL. At a minimum, specimens to be collected from live affected swine are serum, whole blood (EDTA or heparin), tonsil scrapings, and nasal swabs. When possible, at least one pig, and ideally five pigs, should be posted and the following tissues collected: tonsil, lymph nodes, spleen, kidney, and distal ileum.

Per VS Memorandum 580.4, EMRS must be used throughout the investigation. The AVIC, FADD, and laboratory personnel must enter all pertinent information that emerges during the

investigation into the EMRS.

Analysis and reporting

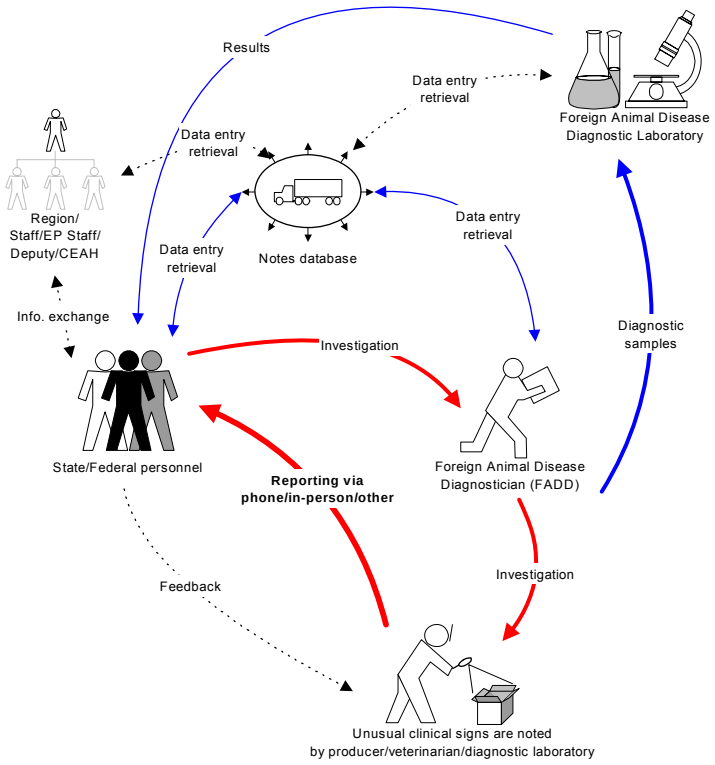
FADDL will attempt to detect CSF antigen in tonsil, spleen and lymph node by immunohistochemistry (IHC) assays; isolate CSF virus from whole blood, tissues and tonsil scraping; and detect CSF nucleic acid by PCR from whole blood, tissues and tonsil scraping. Serum will be screened for CSF antibody by ELISA or immunoperoxidase assay (IP) and confirmed by immunoperoxidase neutralization test, if positive by ELISA or IP. Results will be entered into EMRS.

CSF data views will be created in EMRS for quarterly evaluation. The herd exam view should contain variables for referral control number, state, date, complaint source, species, initiation reason, # sick, # dead, # affected, total, herd size, and differential diagnosis in field. The sample / lab report view should contain referral control number, state, date, sample id, # animals sampled, # samples, sample type, disease, test type, access #, result, test interpretation.

CEAH will be responsible for the routine and ad hoc analysis of CSF surveillance data collected via EMRS system. Reports should be distributed to FADDL, regional offices, National Center for Animal Health Programs (NCAHP), and NSU.

The following flowchart depicts the data flow for this surveillance program. A response plan developed by EP stipulates the actions to be taken based on test results and investigation findings.

Flowchart A. Reporting of suspicious clinical signs by practicing veterinarians/producers/ diagnostic laboratories and follow up by a Foreign Animal Disease Diagnostician (FADD)



2) Laboratory-based surveillance of serum and tissue submitted from sick pigs.

Target population:
The intended coverage of this surveillance program would be any and all premises where domestic swine exist. This includes all 50 states. Any laboratory or slaughter plant is encouraged to submit tissues from sick pigs for routine surveillance to the National Animal Health Laboratory Network (NAHLN). If CSF is actually suspected, then samples should be submitted to FADDL per surveillance program 1 (described previously).

Actual population:
Currently, few tissues from sick pigs are submitted to FADDL and from only a handful of diagnostic laboratories. Therefore, this plan seeks to enhance the submission of tissues from sick pigs, specifically in high risk states.

The actual population covered by this surveillance program, from which tissue samples from sick pigs will be submitted, will vary by state. It is defined by the catchment population for the two primary sources of tissue specimens – veterinary diagnostic laboratory submissions from private practitioners and condemnations at federally inspected slaughter establishments.

Case definition:
Selection criteria for laboratory submissions:
For diagnostic laboratories in the high risk states, except for Iowa and Minnesota, the following selection criteria will be used to identify eligible cases for routine CSF surveillance testing by CSF approved NAHLN laboratories.

- Any swine accession from which at least one of the following specimens can be obtained:
- Tonsil tissue biopsy, tonsil scraping, or nasal swab.

For Iowa and Minnesota veterinary diagnostic laboratories, any and all accessions that meet the above selection criteria and possess one or more of the following lesions should have tissues set aside for preparation, boxing, and shipment to a CSF approved NAHLN laboratory for routine CSF surveillance testing:

- Dramatic acute septicemias
- Abortions, particularly with congenital deformities
- Dermatitis or Nephritis (PDNS is a rule out)
- Undiagnosed CNS cases (especially congenital tremors & nonsuppurative encephalitis)
- Other undefined cases that the pathologist wishes to submit

Selection criteria for slaughter condemnations:
Any and all condemnations of market swine due to erysipelas or septicemia should have tissues set aside for preparation, boxing, and shipment to a CSF approved NAHLN laboratory for routine CSF surveillance testing. Tonsil should be collected from all eligible carcasses.

Laboratory criteria for diagnosis:
Accessions that meet the selection criteria for either diagnostic laboratory submissions or slaughter condemnations that yield an inconclusive or positive result on real time RT-PCR at a CSF approved NAHLN laboratory.

Case classification:

Cases that meet the laboratory criteria for diagnosis will be classified as a "suspect" case. Additional case classifications can be found in the full CSF case definition (Appendix A).

Data collection and sampling:

The table below provides the expected number of eligible cases meeting the defined case selection criteria for laboratory submissions. The estimates for lab submissions were obtained from the respective laboratory directors or other personnel. With the exception of Iowa and Minnesota, they reflect total swine case load. Nine of the eighteen high risk states have a CSF approved NAHLN laboratory. There are three states (CO, LA, WI) that are not high risk states but have a CSF approved NAHLN laboratory. The implementation plan details how specimens from the high risk states will be allocated to CSF approved NAHLN laboratories.

Expected number of laboratory submissions from high risk State

Region	State	High Risk	NAHLN testing	Number of submissions
ERO	Florida	√	√	10
	Georgia	√	√	90
	Illinois	√		1200
	Indiana	√		800
	Minnesota	√		1300
	New Jersey	√		50
	New York	√	√	10
	North Carolina	√	√	450
	Puerto Rico	√		0
	Subtotal			3910
WRO	Arizona	√	√	10
	California	√	√	175
	Hawaii	√		0
	Iowa	√	√	1300
	Kansas	√		150
	Nebraska	√		1250
	New Mexico	√		10
	Oklahoma	√		120
	Texas	√	√	400
	Washington	√	√	60
	Subtotal			3475
	Total			7385

Specimens for routine CSF surveillance from eligible laboratory submissions should include tonsil, or tonsil scraping, and nasal swab when available. Alternative samples listed above can be used if neither is available but would require submission to FADDL since these are not validated for the PCR testing to be performed in approved NAHLN laboratories.

The other key source of tissue specimens for routine CSF surveillance is market swine condemned at slaughter. Based on FSIS data, in the 18 high risk states there are 272 slaughter establishments that slaughtered 71,838,236 market hogs in 2003 (80.3% of US total). There were 24 establishments that slaughtered at least 500,000 market swine in 2003, or a total of 68,364,534 market hogs (95.2% of total in high risk states). Since several of the high risk states had no establishments that slaughtered at least 500,000 market swine, the largest slaughter establishment(s) were also designated to provide specimens for routine CSF surveillance: FL(2), GA(1), HI(1), KS(1), NY(1), TX(3), WA(1). Therefore, a total of 34 slaughter establishments in the 18 high risk states have been designated for active surveillance of sick pigs.

Expected number of carcass condemnations per year by State

State	Number of slaughter establishments	Number designated for surveillance	Total number of pigs slaughtered[1]	Number of eligible condemnations per year[1]
AZ	1	0	---	0
CA	16	1	1,675,568	469
FL	17	2	62,899	5
GA	17	1	37,901	17
HI	6	1	15,340	58
IL	22	2	3,893,590	321
IN	8	2	6,555,522	791
IA	22	9	26,301,373	5051
KS	9	1	177,177	9
MN	26	2	8,895,972	1010
NC	21	2	9,102,091	745
NE	20	3	6,052,078	242
NJ	9	1	540,372	24
NM	1	0	---	0
NY	36	1	11,945	1
OK	8	1	4,709,803	658
TX	27	3	133,683	0
WA	6	1	12,610	3
Total	264	34	68,840,028	9404

[1] From 34 designated slaughter establishments.

* Note that condemnation rates in NE and NJ is well below average.

Specimens from eligible swine should be collected, prepared, and shipped according to specifications in the CSF surveillance manual (currently under development). The appropriate CSF surveillance submission form should be completed and accompany specimens being sent to a CSF approved NAHLN laboratory. The CSF approved NAHLN laboratories will run real-time RT-PCR for CSF on all submissions meeting the above selection criteria for laboratory submissions according to NVSL standard operating procedures (VALSOP0012.01 or VALSOP0013.01). Results will be entered into the NAHLN database. Confirmatory testing for inconclusive or positive results must be performed at FADDL.

***Analysis and reporting*:**

CEAH will be responsible for the routine and ad hoc analysis of CSF surveillance data collected via NAHLN. The number of samples tested by source and state should be summarized by CEAH and reported to NCAHP and NVSL (including NAHLN coordinator) on a quarterly basis. A more detailed annual report (to be drafted later) should be summarized and distributed to a wider audience, including industry.

3) Active surveillance of high risk swine in FL, TX, PR.

These three states present the highest risk for the introduction of CSF into US swine and therefore warrant special attention to CSF surveillance.

Target population:
The intended coverage of this surveillance program is high risk swine in FL, TX, and PR. This includes swine fed waste containing meat scraps, swine exposed illegal movement of people and / or pigs, and swine that can be considered transitional or feral.

Actual population:
For FL, existing slaughter establishments were listed and plotted on a map. In accordance with input from FL animal health officials, two slaughter establishments were designated for random collection of whole blood. The catchment population for these establishments includes pigs in the southern part of the state, light weight pigs, or pigs from transitional herds.

For TX, existing slaughter establishments were listed and plotted on a map. In accordance with input from TX animal health officials, three slaughter establishments were designated for random collection of whole blood. The catchment population for these establishments includes pigs in the southern part of the state, feral swine, or pigs from transitional herds.

For both FL and TX, animal health officials should collect specimens from other high risk swine as deemed appropriate, e.g. clinically ill pigs discovered during waste feeding inspections.

For PR, essentially all swine on the island are considered high risk swine raised by small scale farmers. Those of particularly high risk are those fed waste or exposed to illegal immigrants that arrive via illegal boat landings (yolas).

Case definition:
For FL and TX, market swine should be randomly sampled at the five designated slaughter establishments. Other cases eligible for surveillance will be defined by the respective state animal health officials. These may include, but are not restricted to, sick pigs on waste feeding sites, small non-monitored slaughter establishments, herd located near landfills or international airports, etc.

For PR, swine sites within 3 km of illegal boat landings are eligible for routine CSF surveillance testing on the fourth visit 28 days after notification of illegal boat landing. Also, samples from slaughter should be collected.

Data collection:
Whole blood should be collected from randomly selected carcasses (roughly every 10^{th} carcass). The following table provides the allocation of samples among the five slaughter establishments. A total of 1800 blood samples from FL and 3400 blood samples from TX should be selected. Whole blood samples should be sent to FADDL. Tonsil tissue or scrapings, nasal swab, or whole blood (EDTA or heparin) should be collected from ad hoc cases selected by state animal health officials. Tonsil or nasal swabs can be sent to the CSF approved NAHLN lab in TX.

State	Plant ID	Total number of pigs slaughtered	Number of samples to be collected
FL	11159	3,147	315
FL	11181	21,511	2156
TX	07041	11,012	1102
TX	13517	34,065	3409
TX	21530	171	140

For PR, there are an estimated Serum will be collected from feral swine randomly selected at the slaughter plant. Specimens collected from slaughter establishment should be either tonsil tissue or scrapings or whole blood (EDTA or heparin). All PR specimens will be sent to FADDL.

Surveillance programs to meet Objective I not covered in detail at this time:

4) VMO/AHT-based active surveillance of registered waste feeders for CSF.
VMO/AHT-based: Waste feeders must be licensed and regularly inspected by State or Federal VMO's and/or AHT's. The intended coverage would be all sites in the continental US feeding waste to swine. This definition of the target population may be too aggressive in some respects and may need to be tightened.
Active surveillance: This targeted population is relatively small, easily definable based on licensure procedures, and is actively monitored.
Registered waste feeders: This population is especially predominant in States likely to receive illegally moved swine. It also covers an industry segment very likely to be missed by surveillance program A.
for CSF: due to the infrequent intervals at which visits would be conducted, it may be sufficient to modify the diagnostic test-based case definition for detection of CSF antibody instead of antigen. As with surveillance program B, the symptomatic case definition should be incorporated into the sample collection.

The next targeted population group, sites exposed to illegally moved swine, is not as easily defined. Perhaps it is easiest to just identify the States that logically seem most at risk: TX, FL, and PR for instance. Currently, serological surveillance is conducted on waste feeders along Texas – Mexico border. This is really a subset of the broader population being targeted here so this program could be rolled into the programs proposed below (4 and 5).

5) Population-based active surveillance of high risk herds.
Population-based: Data collected directly from producers in a 1 km area surrounding disposal sites for pork meat scraps of foreign origin, e.g. airports and military bases. Also, data collected directly from producers or practitioners from those production sites importing any type of genetic material from any foreign country with in the previous 3 months.
Active surveillance: This definable population should be relatively small and therefore can be actively monitored either using private practitioners or VMO's. Samples could be collected once, twice, or more times in the surveillance period.
Serological samples: The main case definition would be diagnostic although the symptomatic could (and should) easily be tacked on to the submission form. With agreed upon assumptions of the percent of hogs likely to be infected with CSF on a site, we can calculate sample size for collection of whole blood.
Herds importing genetic material: The definition of the targeted population is those production sites importing live swine, semen, or germplasm.

Objective II: Monitor the risk of introduction of CSF into US swine.

A population that should be targeted for CSF surveillance is those swine herds that either receive visitors from other countries or have employees that visit other countries. Unfortunately, this population is not easily identifiable and is actually quite large (based on estimates from NAHMS Swine 2000 study) making it a poor candidate for active surveillance on a targeted population. A better approach may be to monitor this risk, i.e. CSF Surveillance Objective II, and follow the data over time to determine if and how these proposed surveillance programs should be modified (or new ones developed).

A. Case definitions / key indicators for tracking

The various ways CSF can be introduced into US swine should be monitored regularly.

The following indicators should be available for tracking:

- Number live pigs, by pig weight/class, imported. Present by State and type of operation importing.
- Number of importations of semen and germplasm. Present by State and type of operation importing.
- Quantity of pork meat, by type, imported. Report by State.
- Movement and travel of people and pets into and out of the US. Cf. CEI report.
- Numbers and geographic distribution of waste feeders.

Most likely these indicators would be summarized by the NSU annually based on secondary data from various sources including FAS database, NCIE, PPQ, FSIS, etc.

B. Target population for surveillance

All US swine producers and production sites including PR.

C. Surveillance programs

1) **Surveillance of secondary data on imports of genetic material from NCIE & FAS.**
   Secondary data: data on the indicators described in previous paragraph already exist and should only be collated on a regular basis, e.g. annually. Great benefit for little investment. Likely sources of this secondary data would be FAD data on-line and NCIE.

2) **Surveillance of secondary data on imports of pork and pork products.**
   As with surveillance program 1, this data already exists. Only need to determine what summary information would be of greatest benefit to track over time, relative to risk of introducing CSF into US swine. Possible data sources are FSIS, FAS, and FDA.

3) **Surveillance of secondary data on travel and commerce.**
   CEI did an excellent report on this data. This should be repeated on a regular basis in order to assess trends in CSF hazards, i.e. movement of mechanical vectors into US.

4) **Surveillance of secondary data on waste feeders.**
   An annual summary of the number of waste feeders by State, with number of hogs on these sites, should be presented. This data is available from VS.

Objective III: Surveillance of international CSF status.

International surveillance for CSF can incorporate CSF outbreak reports identified via OIE, Pathfinder, or IS attaché reports.

III. Implementation plans

A. Prioritization of objectives

Surveillance Objective I is the highest priority in the comprehensive CSF surveillance plan. For meeting this objective, the first three surveillance programs are the top priority. Of these, the reporting of suspicious CSF cases must always take precedence over the other CSF surveillance activities. The level of reporting is currently inadequate and this plan seeks to improve reporting through development of a CSF case definition and implementation of a CSF awareness program. Passive reporting of suspicious cases is to be augmented by active surveillance of sick pigs in high risk states and active surveillance of high risk swine in the three states deemed the highest risk.

B. Implementation activities

The first three programs are to be implemented beginning in FY05. Other items are meant for long term implementation.

For surveillance program 1:

A communication plan should be implemented in the first year to increase awareness among producers and practitioners in high risk states of the CSF case definition and reporting criteria. The objective of this plan would be to reach practitioners and producers with information about CSF in an effort to reinforce existing knowledge and build awareness of the disease. This plan would include distribution of information regarding biosecurity, clinical signs, disease detection, response and recovery.

The awareness program for practitioners should cover the following items:

(i) inform them about the enhanced CSF surveillance via NAHLN
(ii) that tonsil is the preferred tissue from eligible submissions to VDL
(iii) for those cases ultimately tested by NAHLN they will receive a $50 reduction in their diagnostic bill.
(iv) however, for cases where CSF is actually suspected, they should call the State Vet or AVIC for a FADD investigation and submission of samples to FADDL

The awareness program for VDL in the 18 high risk states should cover the following items:

(i) inform them about routine CSF surveillance via NAHLN
(ii) the selection criteria for swine submissions
(iii) the process for submitting eligible tonsil specimens to their designated NAHLN lab
(iv) request that they communicate with their swine practitioners that tonsils should be included in swine submissions.

Funding should be provided to NPB to implement the communication plan which would utilize existing communications tools to communicate with both veterinarians and producers, and employ new tools to effectively communicate the information when necessary.

A second task is to change what tissues are included in case submissions sent to veterinary diagnostic laboratories, especially from large integrated farms where necropsies are not performed by veterinarians but field / service managers. The best approach for accomplishing this change will be determined via the AASV Swine Health Committee.

Also in the first year of implementation, actual summary reports will be drafted and a distribution plan developed for both quarterly and annual summaries.

For surveillance program 2:
Tissues from eligible laboratory submissions should begin being sent to FADDL immediately. FADDL should use EMRS for data entry.

For development of data management, a change control board (CCB) will be established and used to assist with decisions regarding data collection and data management. Key decisions will be communicated with the NAHLN steering committee and IT committee to continue development of a NAHLN database. Data submission forms have been drafted and will be finalized by the end of FY05. Initial data collection forms will be hard copy only with eventual migration to web-based data entry or use of PC tablets at collection sites.

The following table provides the specific allocation of specimens collected from diagnostic labs and slaughter establishments that are to be tested at a CSF approved NAHLN lab.

				VDL					Slaughter					
Region	State	High Risk	NAHLN	Received	Shipped	to	Arrived	Tested	Collected	Shipped	to	Arrived	Tested	Total Tested
ERO	Florida	√	√	10			50	60	5			1324	1329	1389
	Georgia	√	√	90			1300	1390	17				17	1407
	Illinois	√		1200	1200	WI		0	321	321	WI		0	0
	Indiana	√		800	800	NY		0	791	791	NY		0	0
	Minnesota	√		1300	1300	GA		0	1010	1010	FL		0	0
	New Jersey	√		50	50	FL		0	24	24	FL		0	0
	New York	√	√	10			800	810	1			791	792	1602
	North Carolina	√	√	450			150	600	745			9	754	1354
	Puerto Rico	√		0				0	0				0	0
	Wisconsin		√				1200	1200				321	321	1521
	Subtotal			3910	3350		3500	4060	2914	2146		2445	3213	7273
WRO	Arizona	√	√	10				10	0			1304	1304	1314
	California	√	√	175				175	469			758	1227	1402
	Hawaii	√		0	0		0	0	58	58	CA		0	0
	Iowa	√	√	1300				1300	5051	5051		242	242	1542
	Kansas	√		150	150	NC		0	9	9	NC		0	0
	Nebraska	√		1250	1250	WA		0	242	242	IA		0	0
	New Mexico	√		10	10	TX		0	0	0			0	0
	Oklahoma	√		120	120	TX		0	658	658	TX		0	0
	Texas	√	√	400	0		130	530	0	0		658	658	1188
	Washington	√	√	60			1250	1310	3				3	1313
	Colorado		√					0				1463	1463	1463
	Louisana		√					0				1294	1294	1294
	Subtotal			3475	1530		1380	3325	6490	6018		5719	6191	9516
	Total			7385	4880		4880	7385	9404	8164		8164	9404	16789

In the first year, States should investigate slaughter establishments to determine if their catchment population is a targeted population group such as feral swine, waste feeders, light weight hogs (junk market pigs culled before normal marketing), etc. Smaller plants may be added in the future depending on their catchment population.

In addition, a description should be made of the catchment population of slaughter establishments designated for routine CSF surveillance. The primary purpose would be to describe the states from which pigs are obtained. Specific questions for the CSF team to consider after reports are received from the respective States include:

- Determine which slaughter plants most KS pigs are slaughtered at (IA, NE, OK?). Add plants in other states to surveillance program if needed.
- Determine which slaughter plants most NM pigs are slaughtered at (OK, CA?). Add plants in other states to surveillance program if needed.

Other long term items to implement include identifying and validating additional testing protocols that can be used by NAHLN labs, e.g. Immunohistochemistry. Also, expansion of specimen collection from diagnostic laboratories and slaughter condemnations in low risk States will need to be considered. In FY06, high risk states that do not have a CSF approved NAHLN lab should receive training and proficiency testing. Finally, with-in three years of implementation of this plan, detailed list of performance metrics should be developed.

For surveillance program 3:
Implementation of surveillance activities in PR will require hiring of additional personnel. This should occur in FY06. Also during FY06 a team should visit PR and work with VS personnel there to develop a detailed CSF surveillance plan specific for PR.

For surveillance programs 4 and 5:
Design of these programs has not yet occurred. In the near term, they will be accomplished on an ad hoc basis in very high risk states (FL, TX, PR). Additional surveillance activities may be designed in the future and incorporated into the CSF surveillance program at a later date.

For other CSF surveillance objectives:
No surveillance programs have been designed to meet the other CSF surveillance objectives. Design of these programs will occur in 2006. No additional testing requirements are expected in surveillance activities related to objectives II or III.

IV. Performance metrics and program evaluation

Three years after implementation, the NSU should conduct an evaluation of the CSF surveillance program to determine the effectiveness of the program and ensure implementation in accordance with the CSF national surveillance plan as approved by the VSMT. Specific metrics for this evaluation are suggested below (by surveillance program).

A. Quantitative

Surveillance program 1:

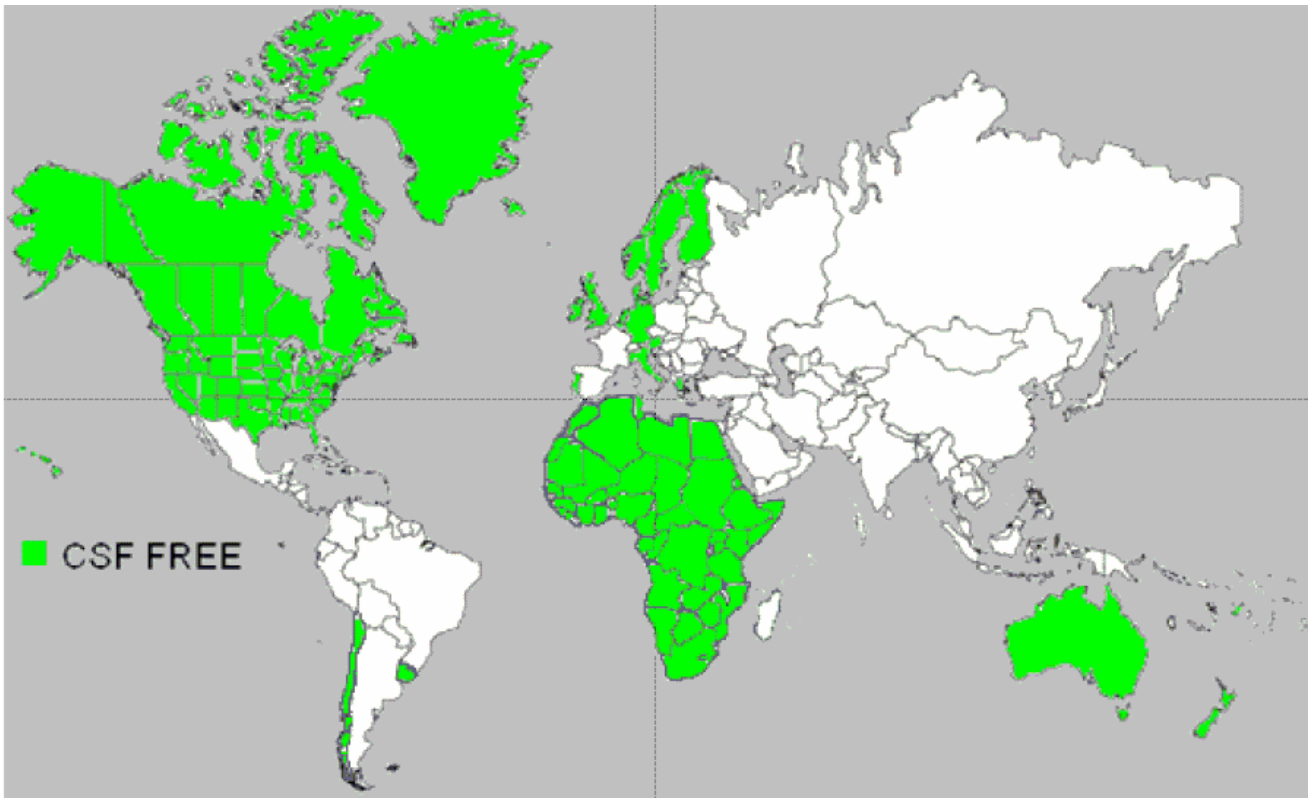
1) FAD investigations should be conducted $\leq$ 8 hours after report to AVIC.
2) FADDL should be report initial results $\leq$ 2 days after receiving samples.
3) FAD investigations should be closed in EMRS $\leq$ 7 days of lab results being entered.

Surveillance program 2:

4) The number of specimens collected from slaughter plants in the first year should be at least 50% of eligible condemnations.

List of figures, tables, and other references

Figure 1: Countries considered free of Classical Swine Fever by USDA-APHIS.



Ref. CSF Pathways Analysis figure 2.5, 2004.